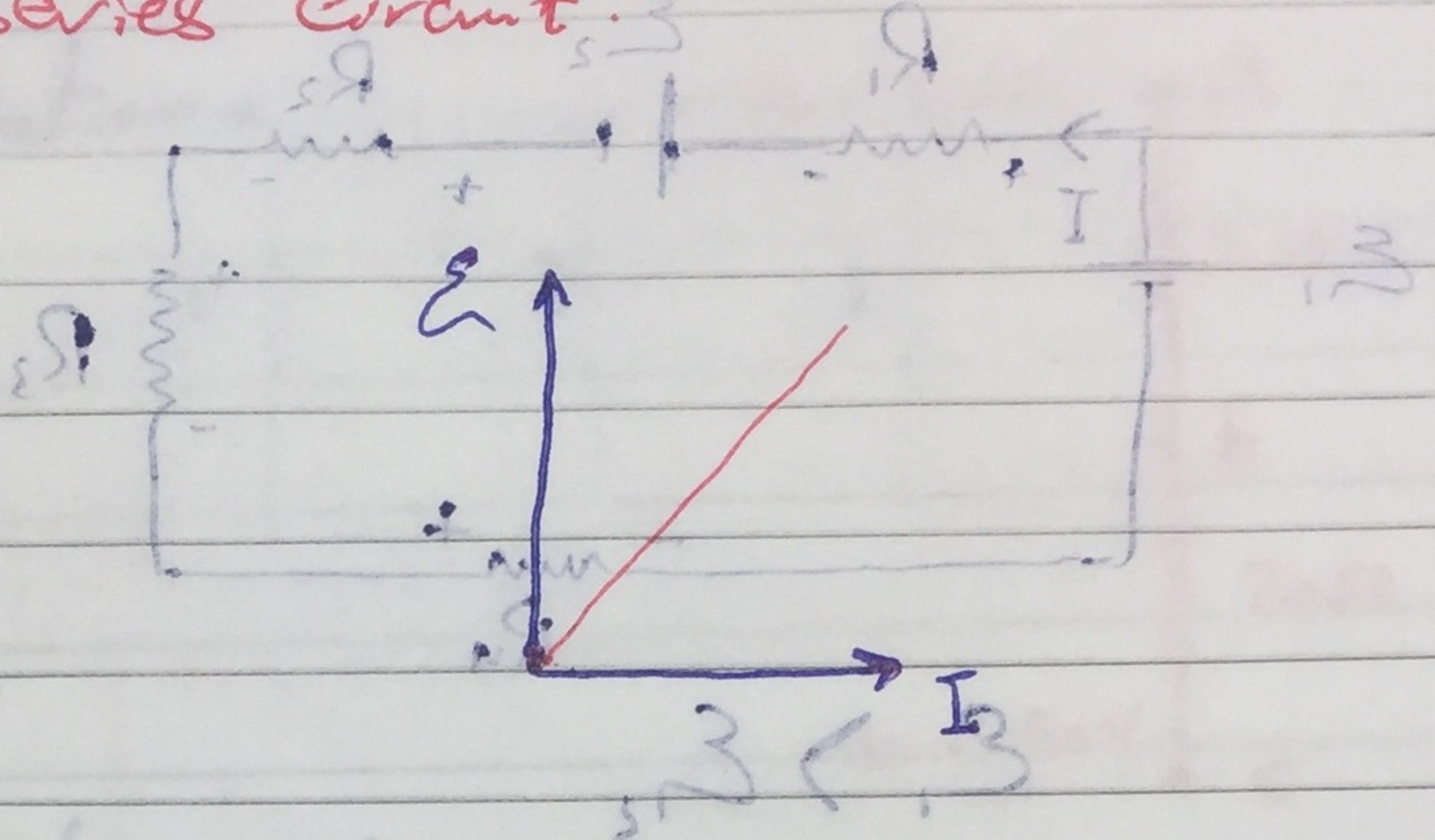
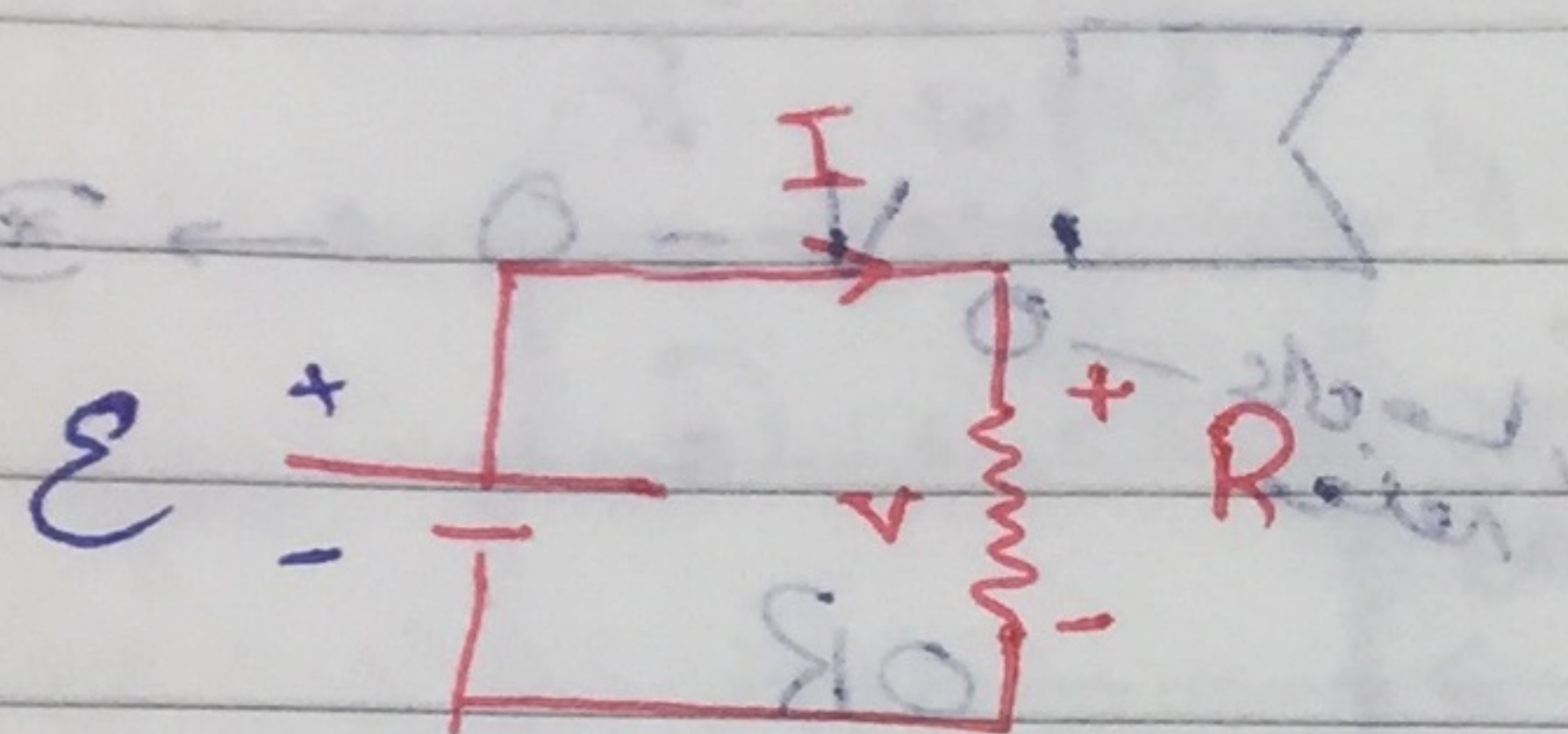


"Basic Laws & Series circuit."

المقاومة



قانون أوم

$$I = \frac{\epsilon}{R}$$

قانون الطاقة

$$P_R = + \epsilon I = 5V \cdot 1A = 5W$$

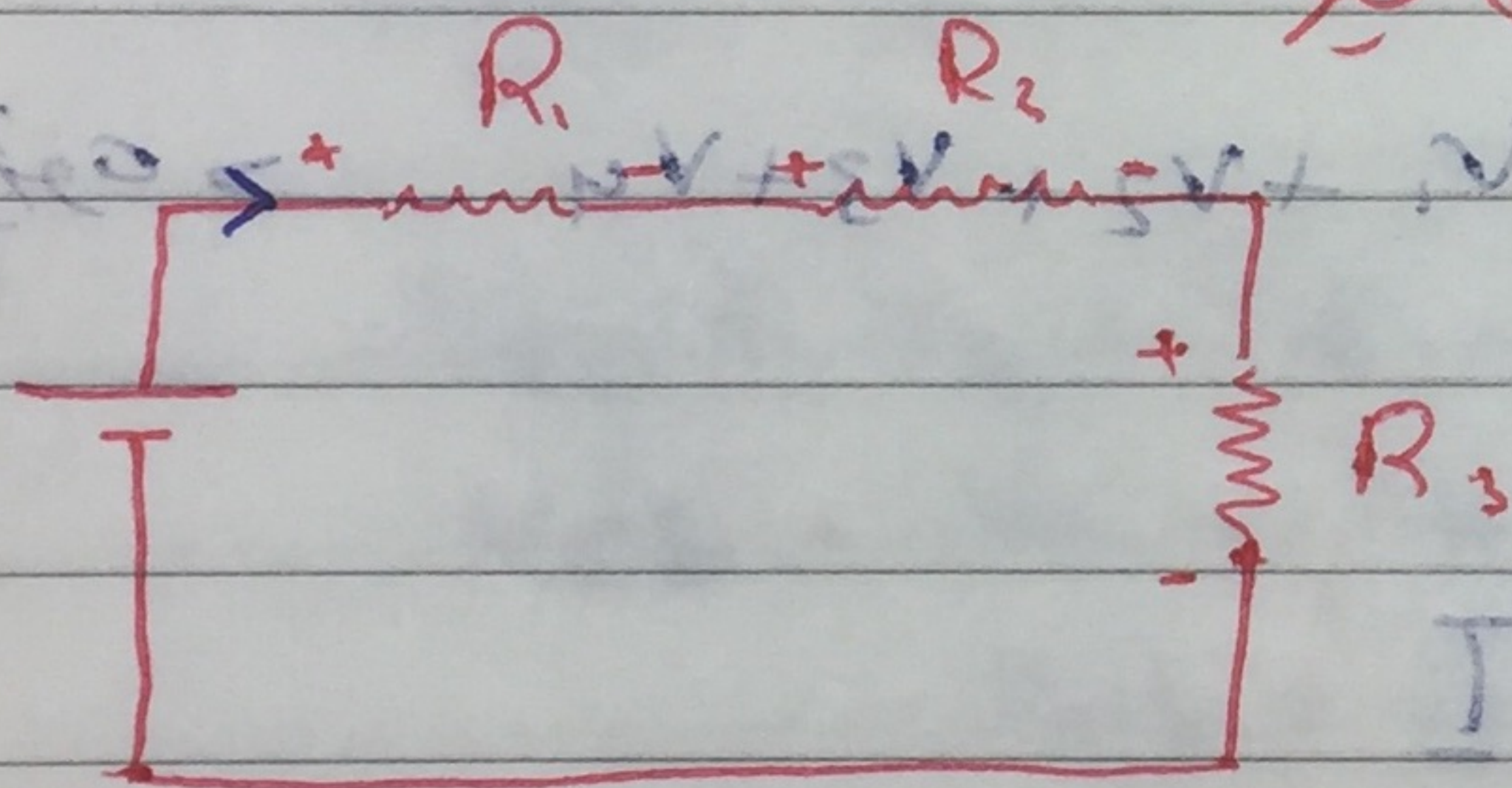
قانون الطاقة

$$P_\epsilon = - \epsilon I$$

قانون الطاقة

$$1W + 5W + 5W + 1W = 12W$$

* حل، دائرة "مقاومات" متصلة في سلاسل



قانون المقاومة

$$R_t = R_1 + R_2 + R_3 \dots$$

قانون توزيع الجهد

قانون توزيع الجهد

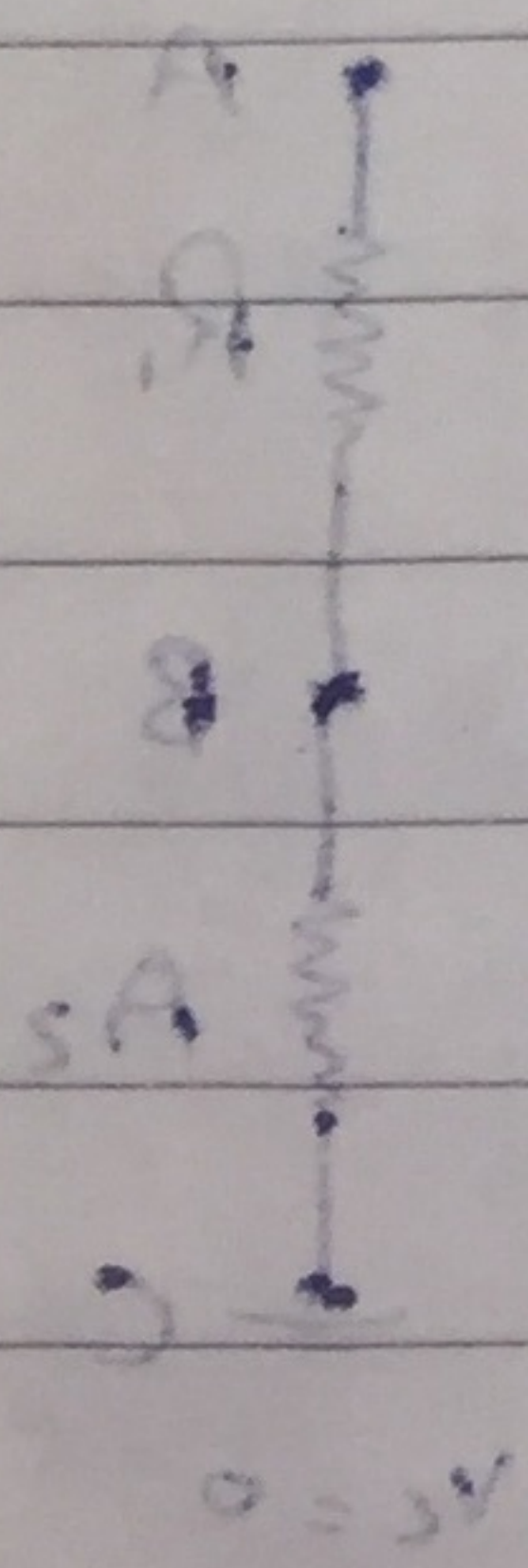
$$V_1 = \frac{\epsilon}{R_t} R_1$$

قانون توزيع الجهد

$$V_2 = \frac{\epsilon}{R_t} R_2$$

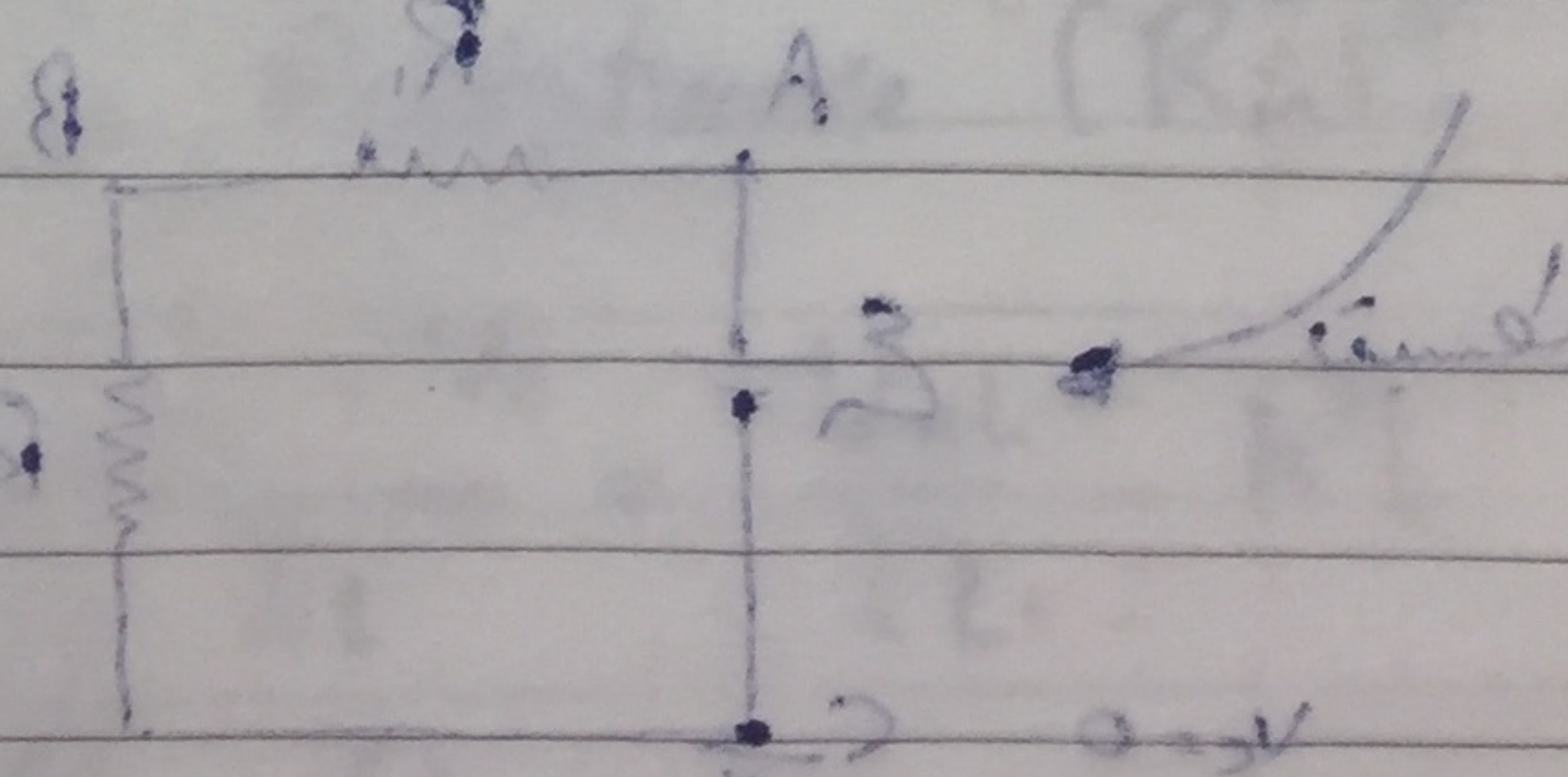
قانون توزيع الجهد

$$V_x = \frac{\epsilon}{R_t} R_x$$

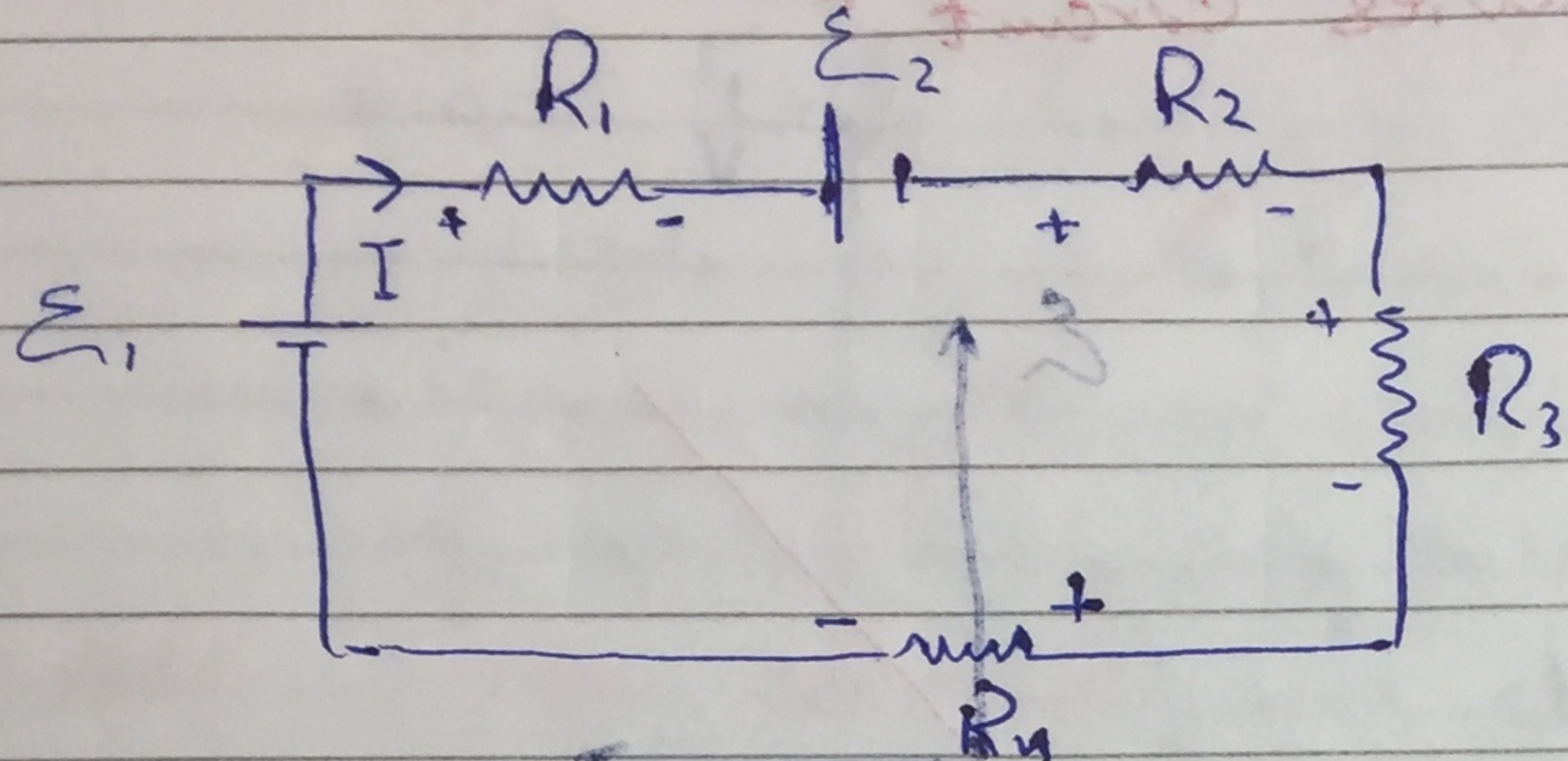


قانون الجهد

$$5V - 1V = 4V$$



* Kirchhoff voltage rule, $\sum V = 0$



قانون كيرشوف

$$\sum V = 0 \rightarrow *$$

OR

$$\sum V_{\text{rise}} = \sum V_{\text{drop}} \rightarrow **$$

عند الارتفاع، $\sum V_{\text{rise}}$
عند الانخفاض، $\sum V_{\text{drop}}$

$$* \quad E_1 - V_1 - V_2 - V_3 - E_2 - V_4 = 0$$

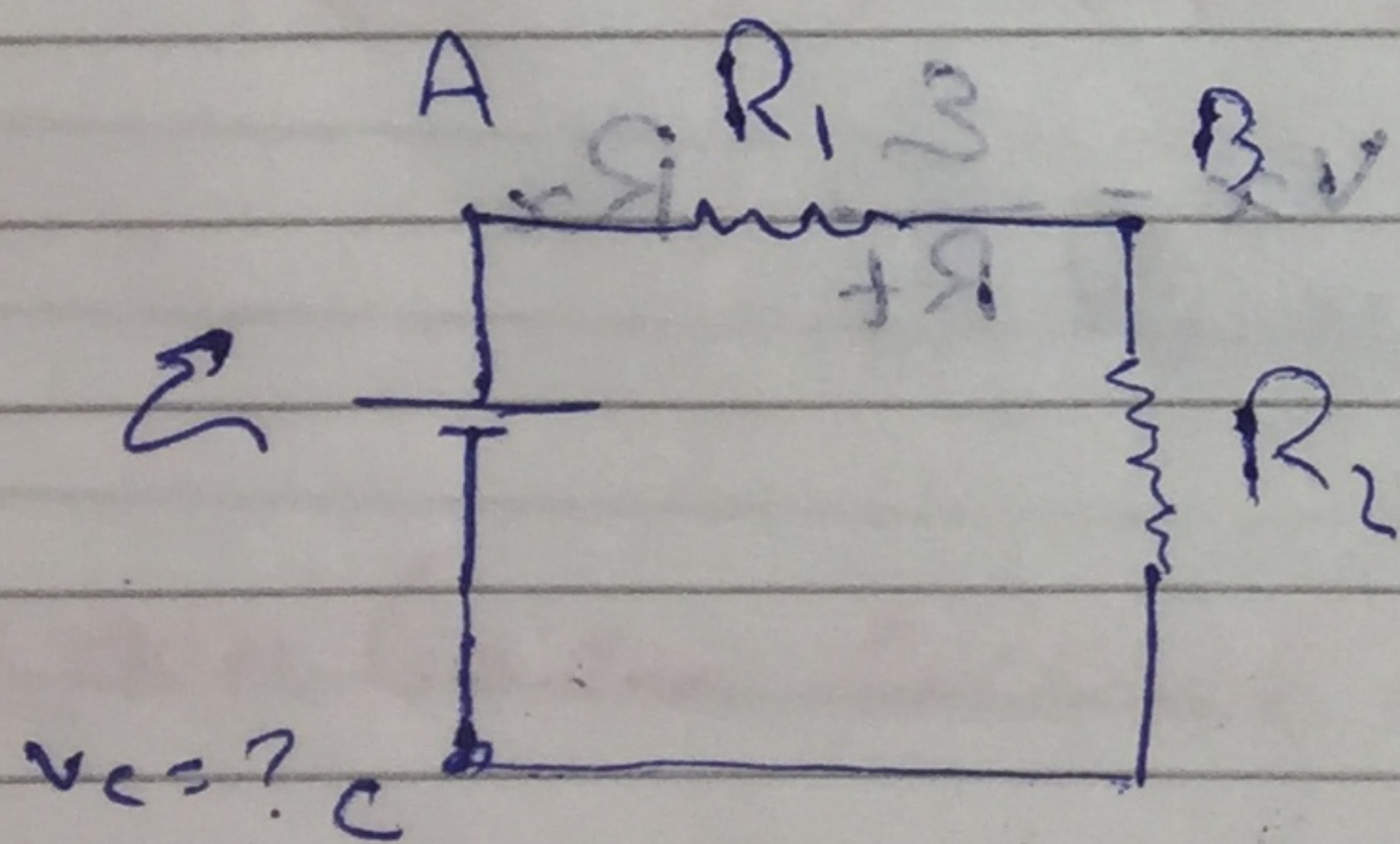
$$E_1 - E_2 = V_1 + V_2 + V_3 + V_4 \rightarrow \text{كيرشوف}$$

$$** \quad E_1 - E_2 = V_1 + V_2 + V_3 + V_4 \rightarrow \text{كيرشوف}$$

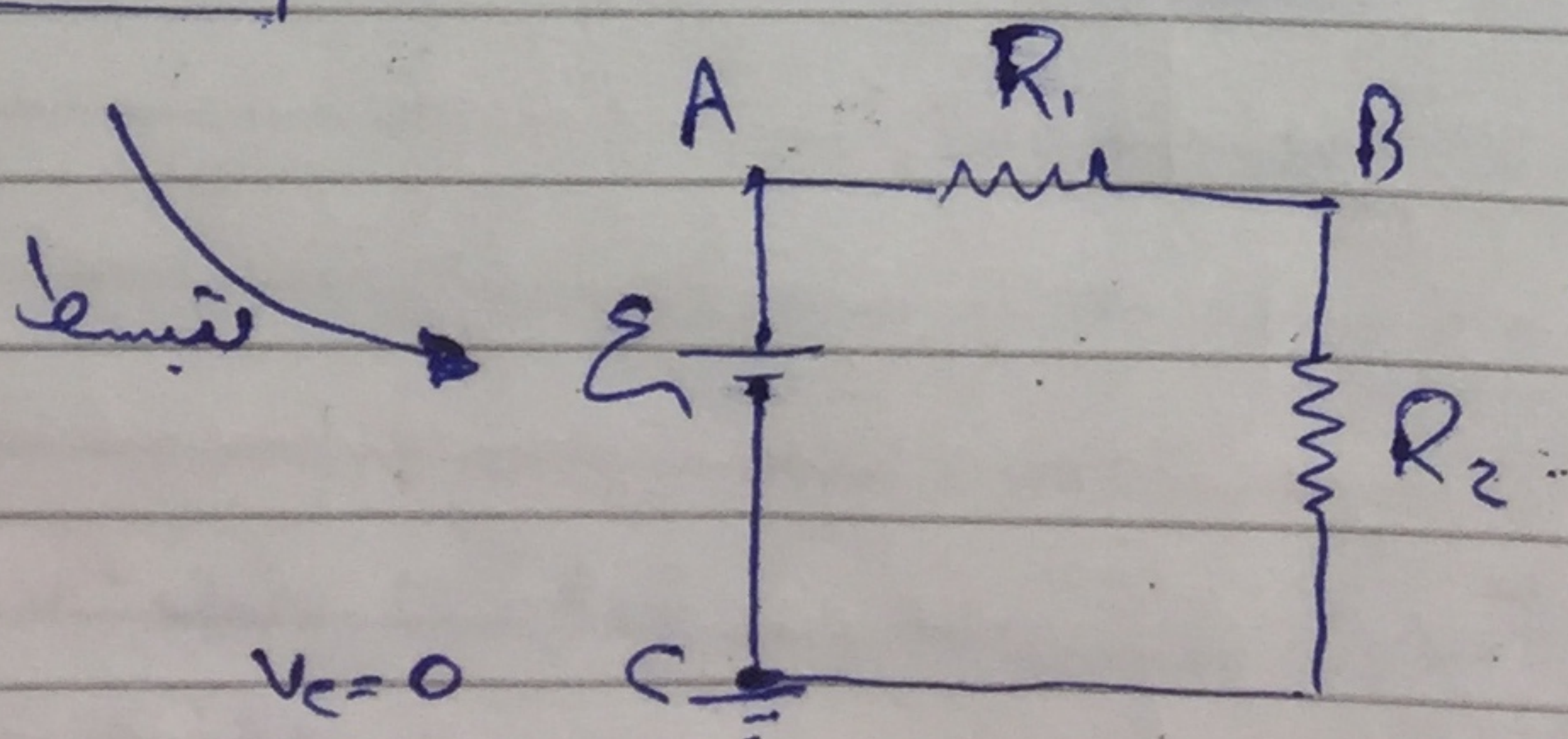
$$P = I^2 R$$

$$P_{\text{supply}} = -E_1 I$$

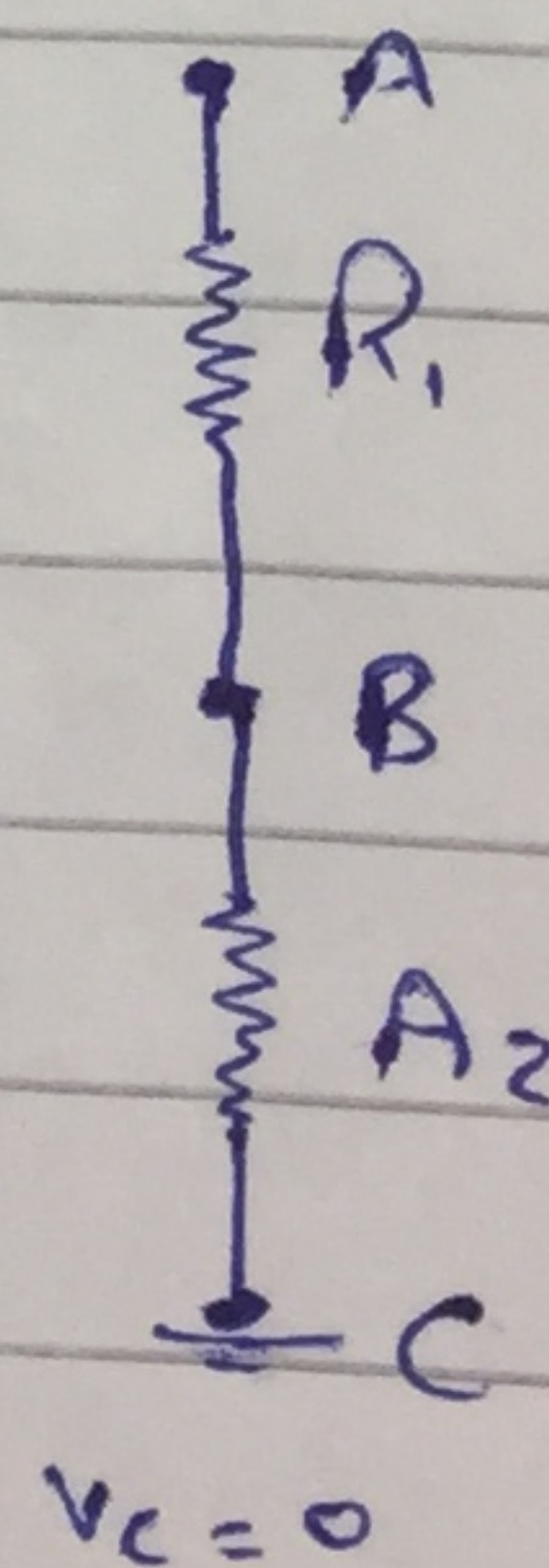
* voltage source and ground $V = 0$?



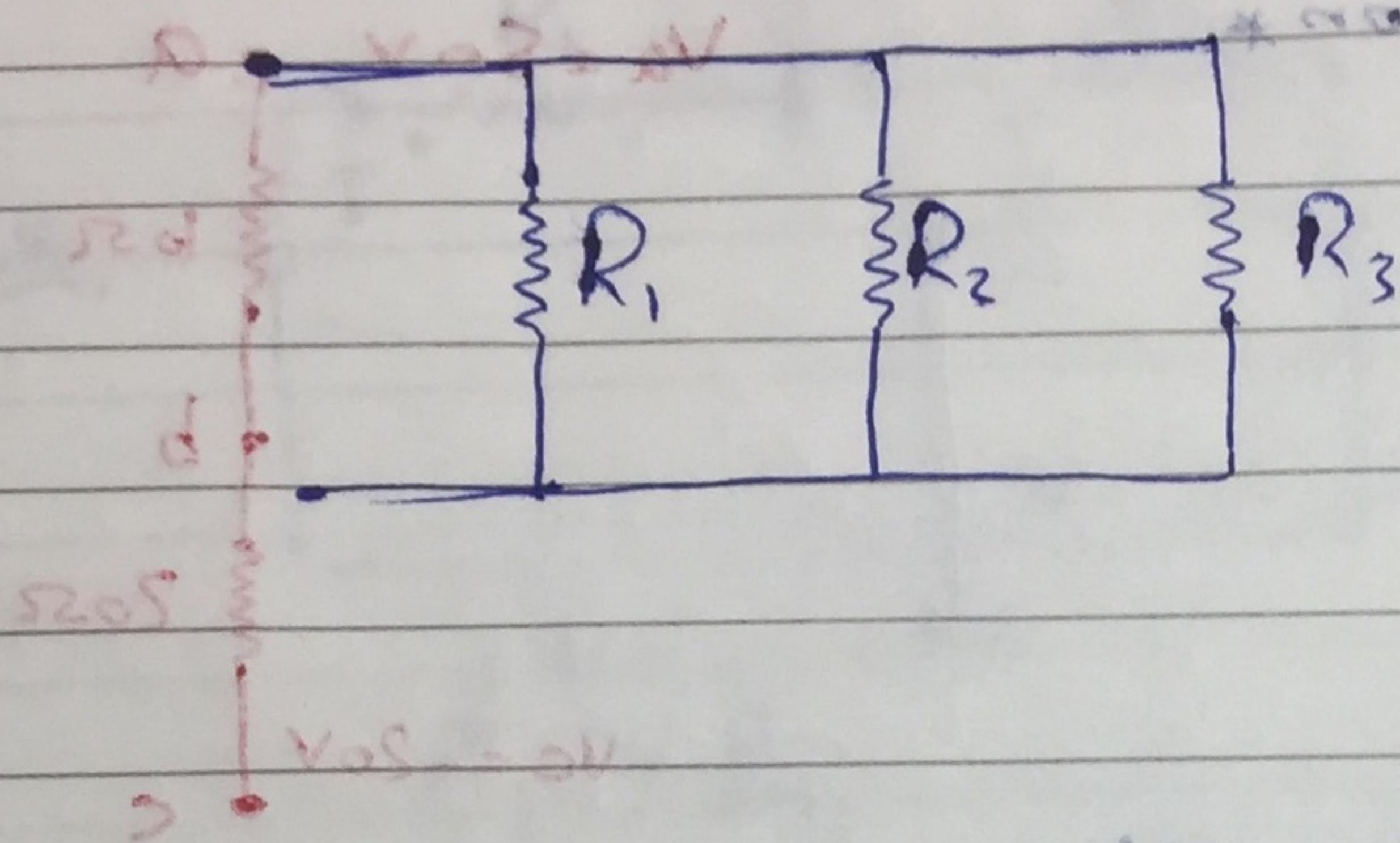
$$E = V_A - V_C$$



$$V_A = E$$



* if it's parallel circuit

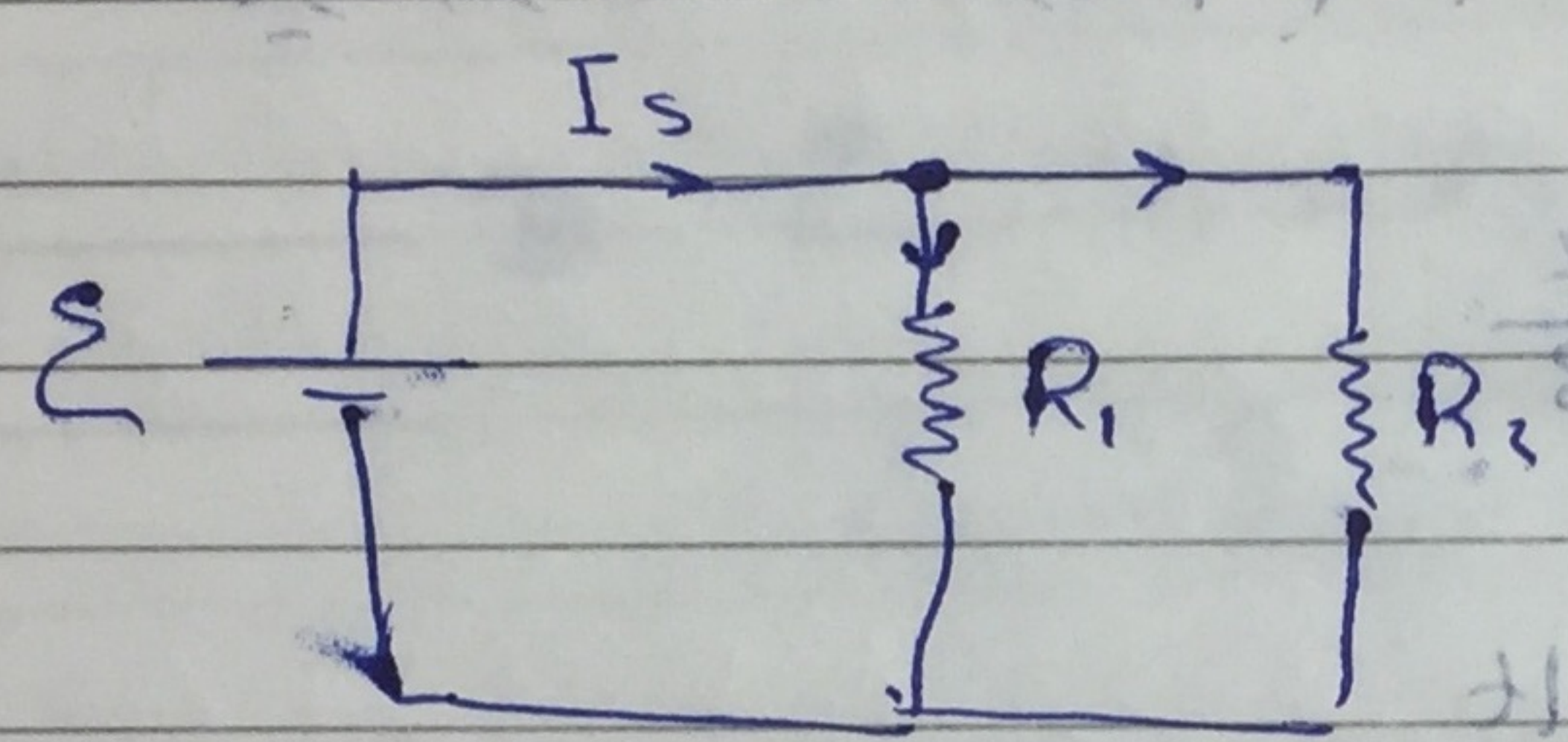


$$\frac{1}{R_{td}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

$$G_t = G_1 + G_2 + \dots$$

R = Resistance

G = conductors

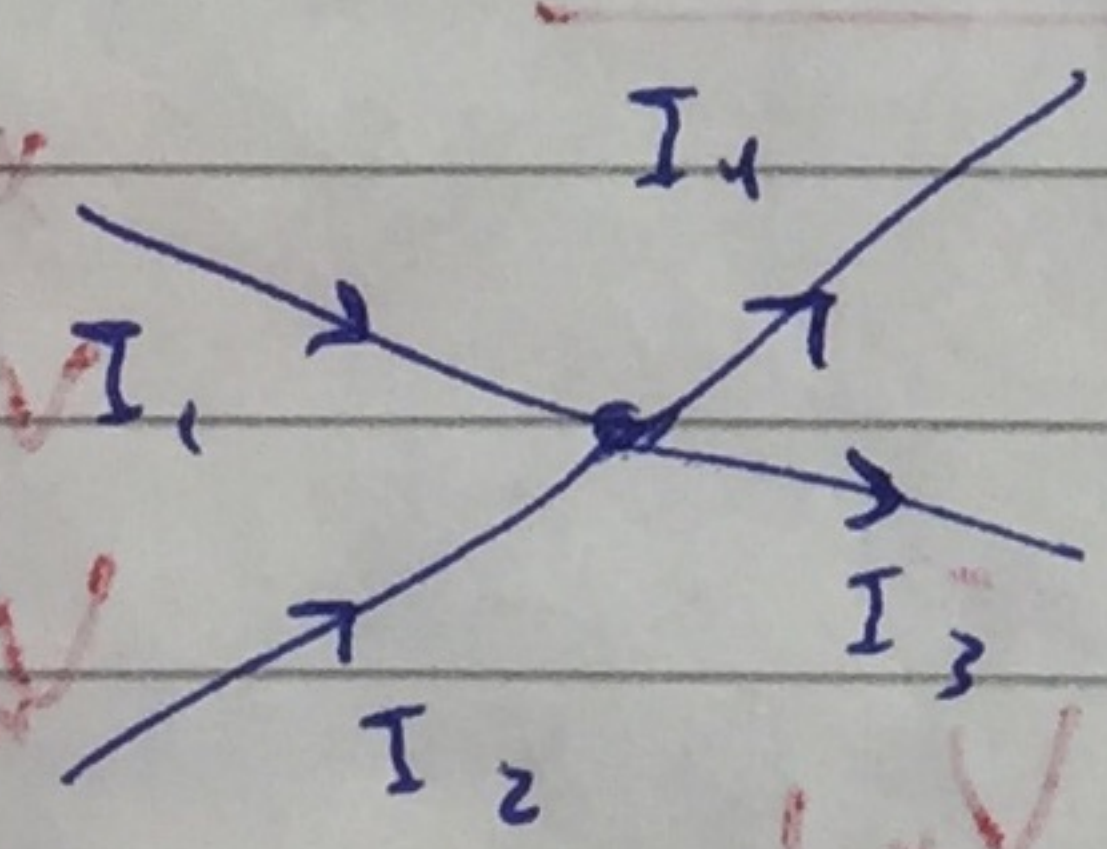


$$\frac{I}{I_1} = \frac{I_s R_2}{R_1 + R_2}$$

$$I_x = \frac{I_s R_t}{R_x}$$

$$I_1 = \frac{I_s R_2}{R_1 + R_2}$$

* Kirchhoff's current law

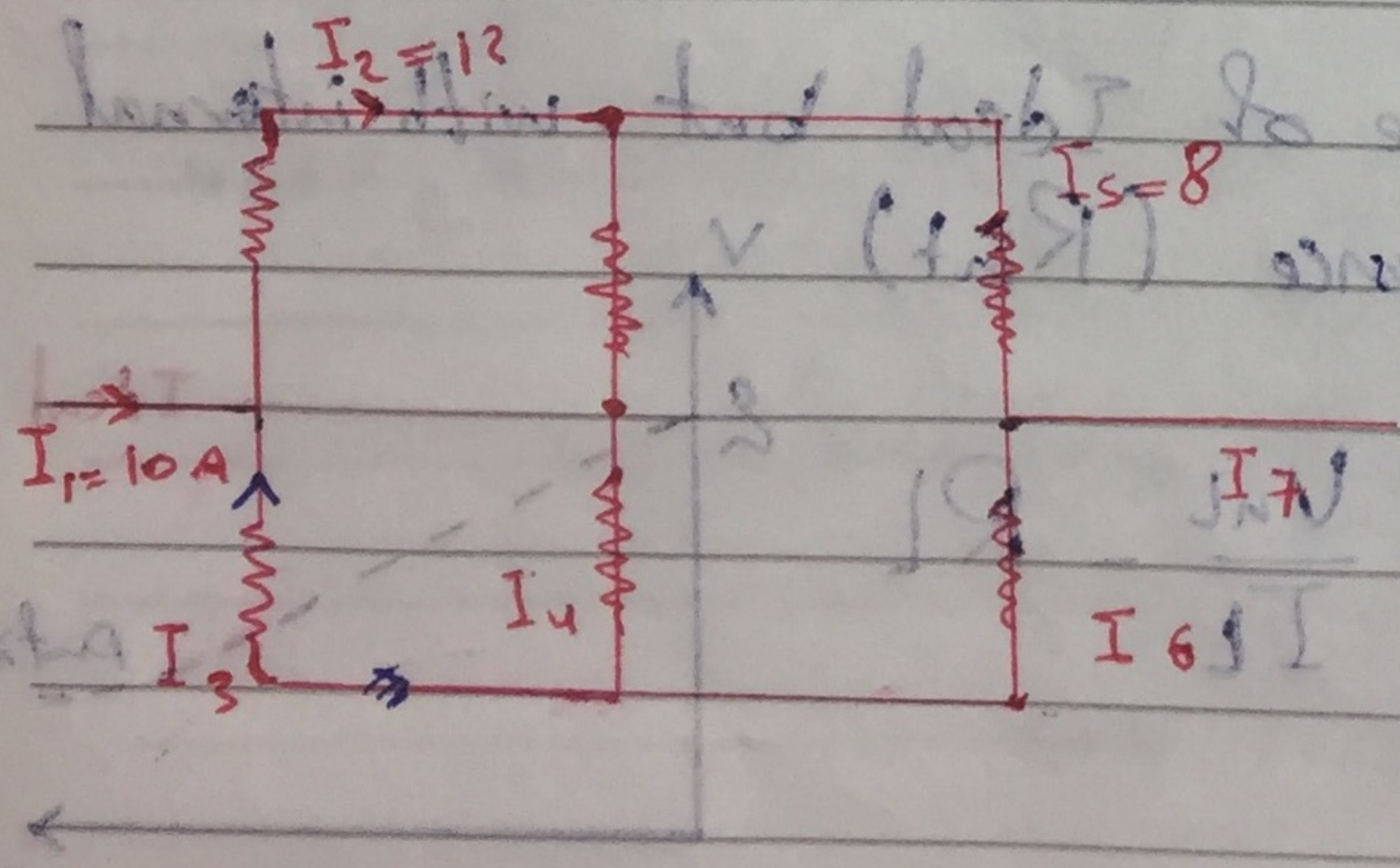


$$I_1 + I_2 = I_3 + I_4$$

$$\sum I_n = 0$$

$$I_1 + I_2 - I_3 - I_4 = 0$$

ex:



$$I_2 > I_1 \therefore I_3 \uparrow = 2A$$

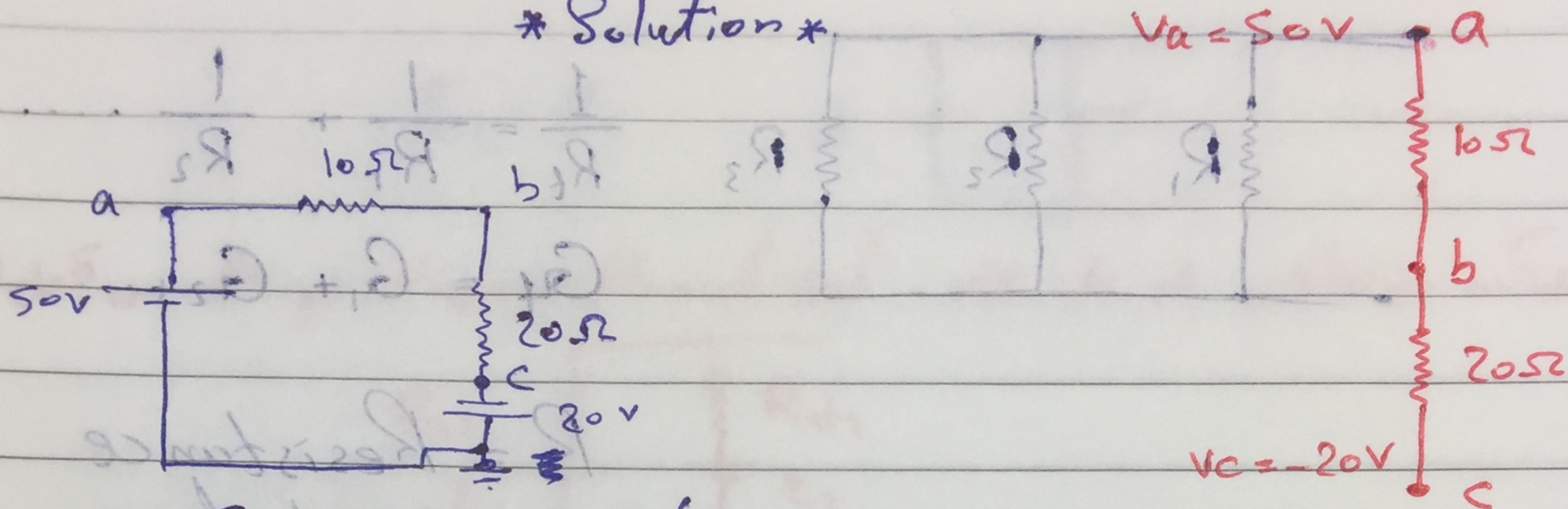
$$I_4 = I_2 - I_5 = 12 - 8 = 4 \downarrow$$

$$I_6 = 2A \downarrow$$

$$I_7 = I_1 = 8A \rightarrow$$

ex: Solve the circuit: find V_{ab} , V_{ac} , V_{cb} :

* Solution *



$$50 + (-20) = I(10 + 20)$$

$$\sum \mathcal{E}_1 + \mathcal{E}_2 = I(R_1 + R_2) \quad \text{Circuit}$$

$$I = \frac{70}{30} = \frac{7}{3}$$

$$V_{ab} = \frac{7}{3} \times 10 \text{ volt}$$

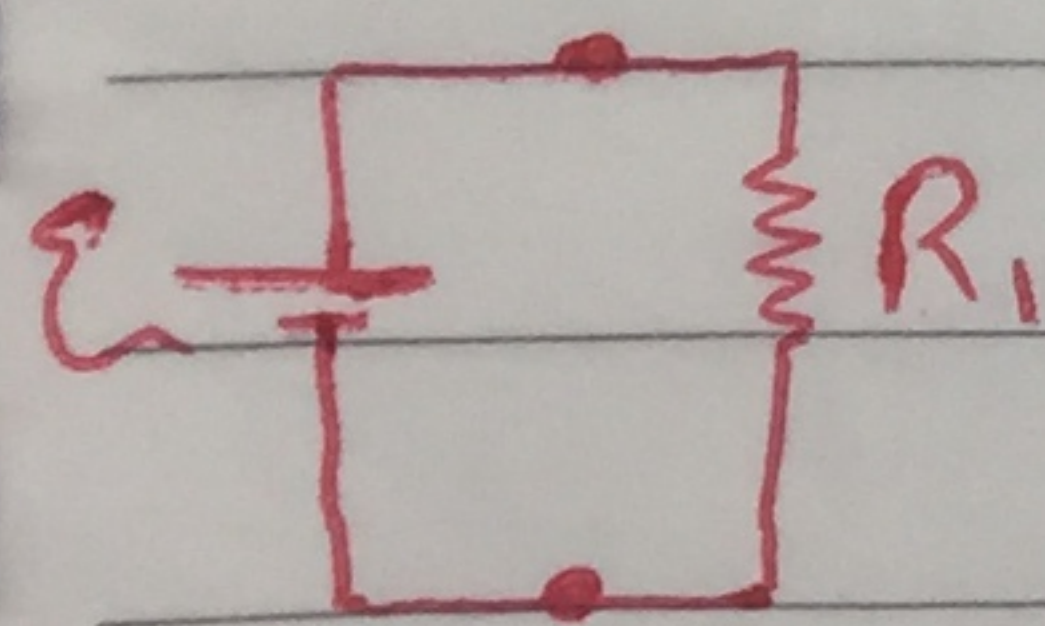
$$V_{ac} = V_a - V_c = 50 - (-20) = 70 \text{ volt}$$

$$V_{cb} = V_c - V_b = -20 - ?$$

$$\therefore V_{cb} = -I \times 20 = -\left(\frac{7}{3} \times 20\right) \text{ volt}$$

* Internal resistance of voltage source:-

• Ideal voltage source



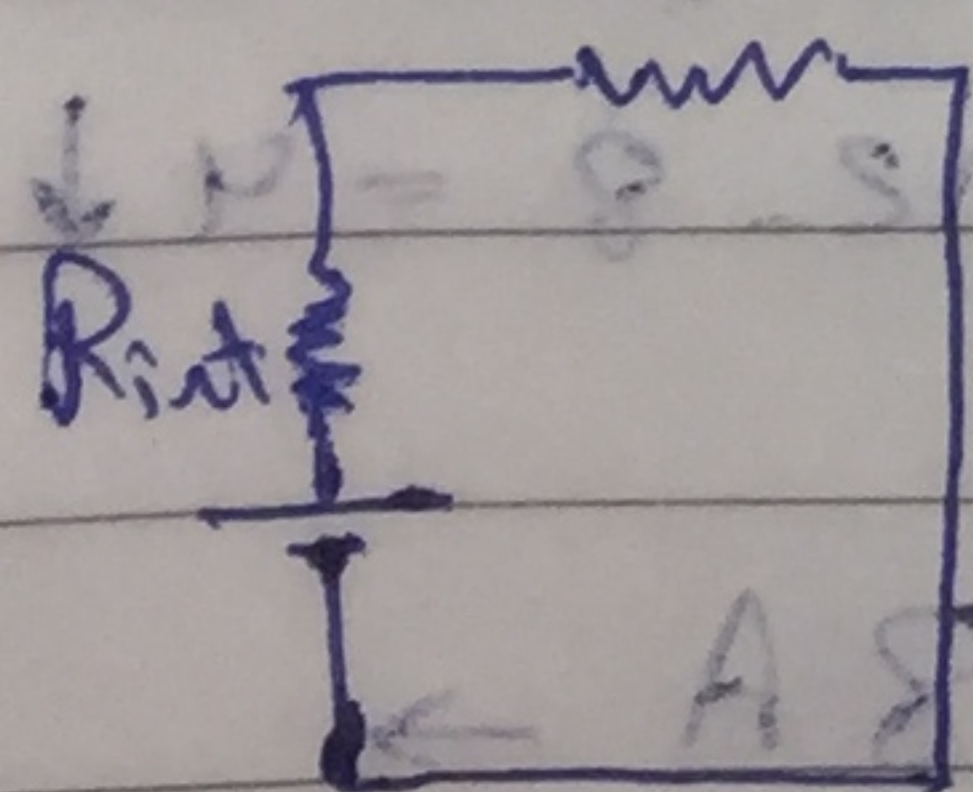
$$\mathcal{E} = V_L \quad \& \quad \mathcal{E} = V_{NL}$$

* notes

$$V_L = V_{\text{load}}$$

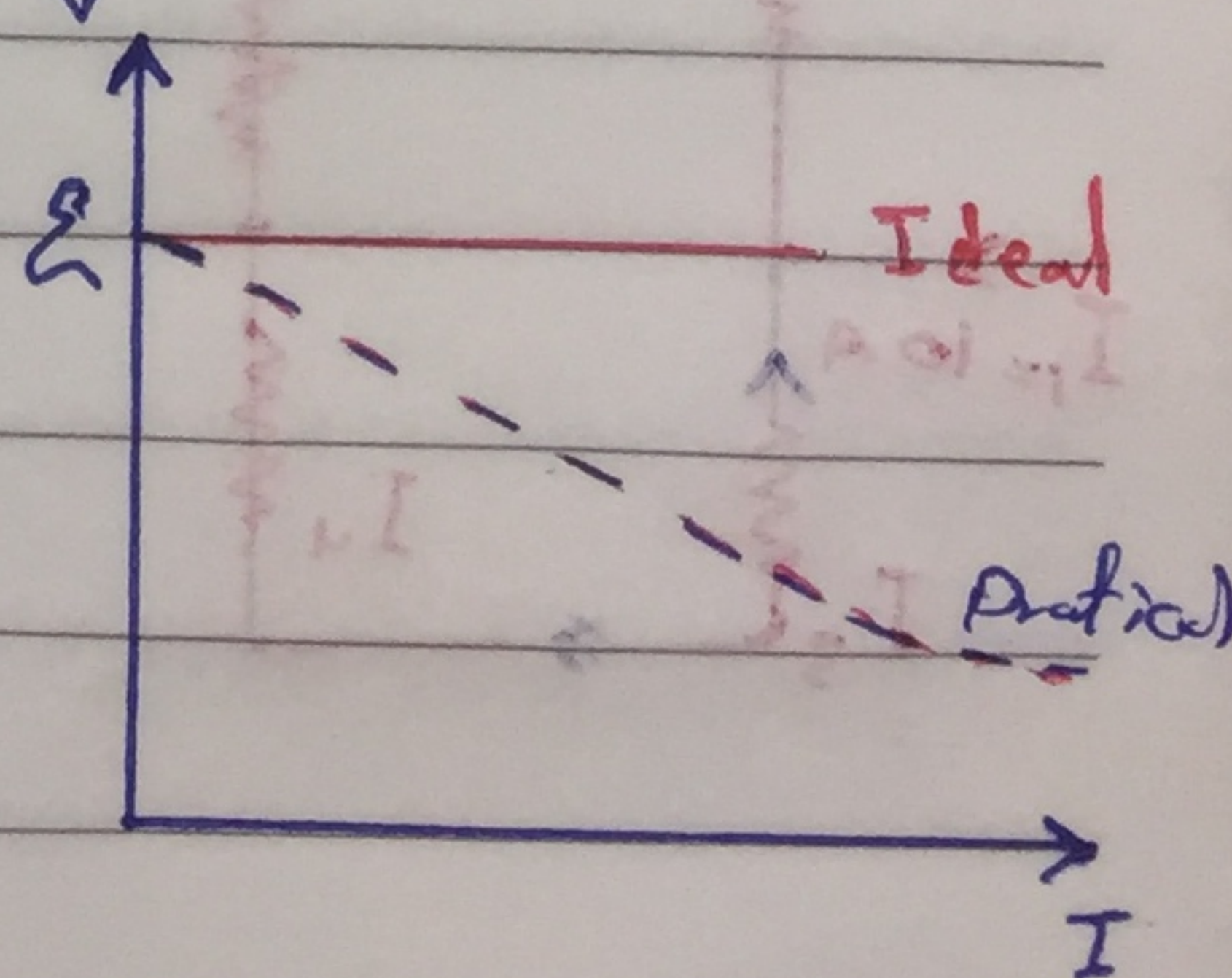
$$V_{NL} = V_{\text{no load}}$$

• practical voltage source: the same of Ideal but with internal Resistance (R_{int})



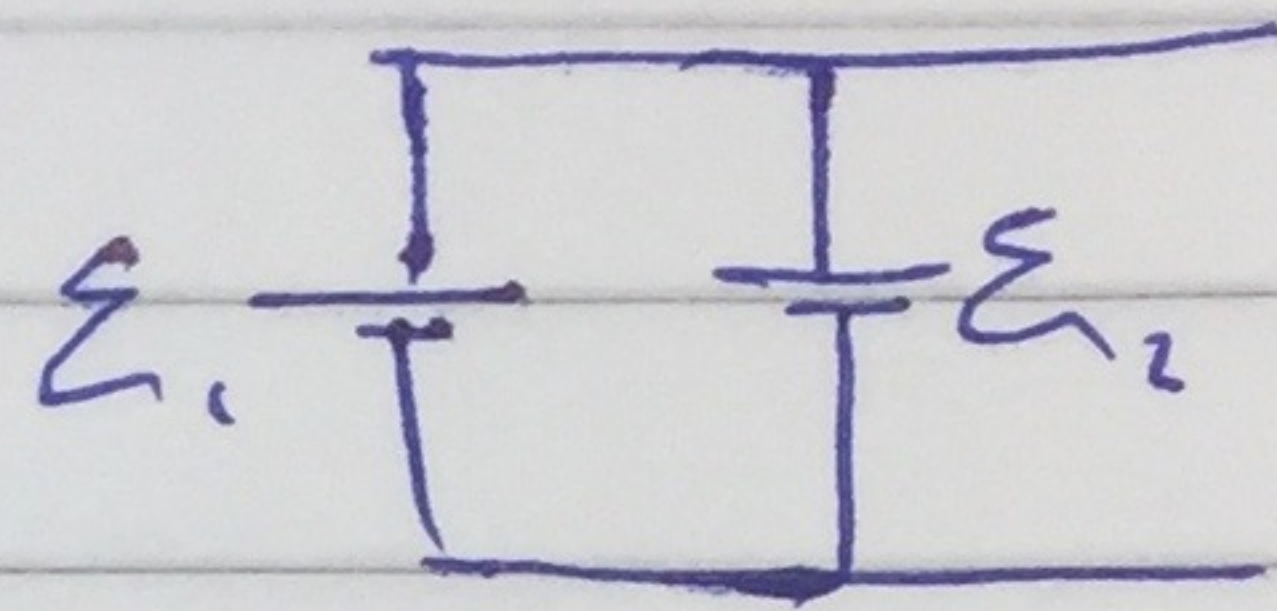
$$R_{int} = \frac{\mathcal{E} - V_L}{I_L} = \frac{V_{NL}}{I_L} - R_L$$

$$P = P_{\mathcal{E}} - P_{\text{loss}}$$

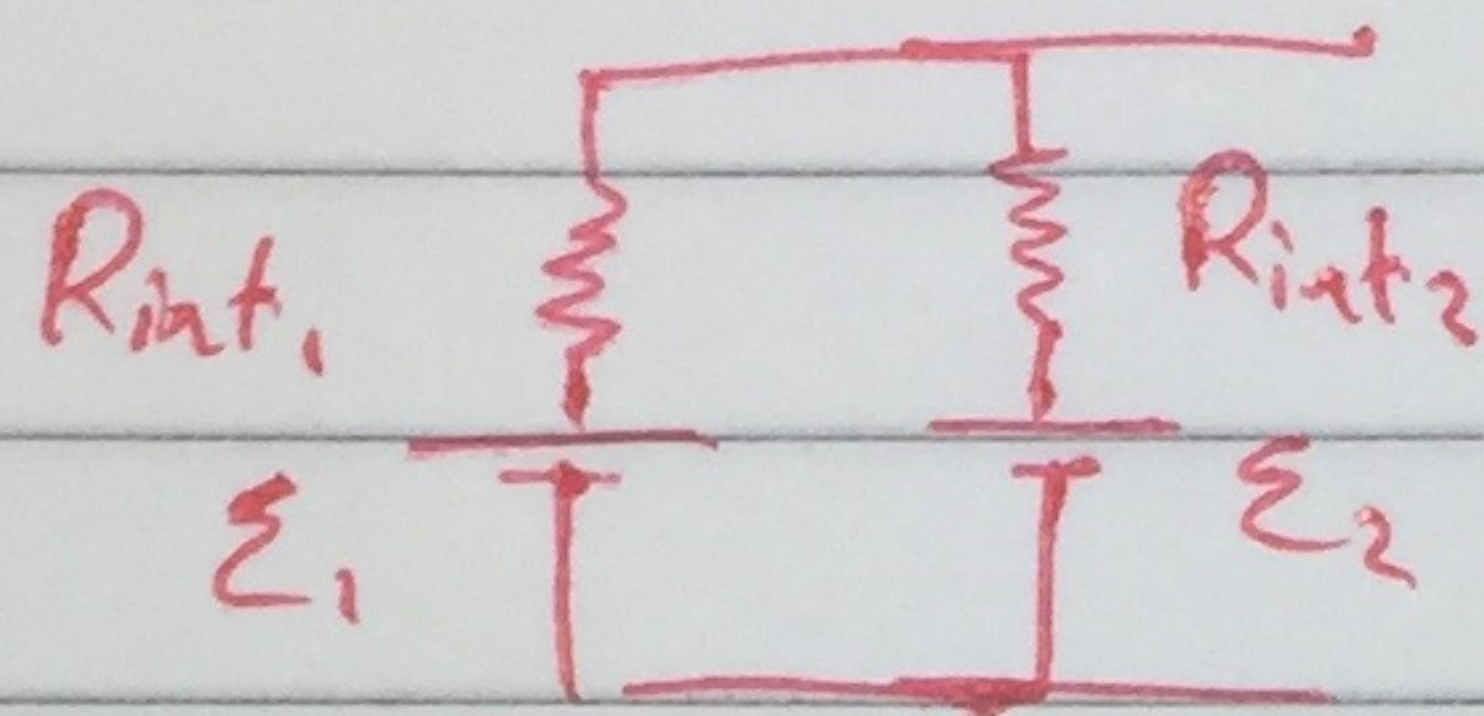


* لولبٹاریتہ کی التوا، Ideal

$$\mathcal{E}_1 = \mathcal{E}_2$$



وہمکنہ موصولہ ہو ہی ہے Practical ہے لازم نہیں ہے قبل البطاریہ



نمایانہ الصافہ ②